3.0 AFFECTED ENVIRONMENT

This section describes the natural and human environment that could be affected by the Proposed Action and the No Action Alternative. The potential environmental consequences of those actions are presented in Section 4. Based on the Proposed Action description, environmental resources that may potentially be affected as a result of implementing the Proposed Action have been considered. Environmental issues are identified and addressed based on the "Sliding Scale Approach" discussed earlier in this EA (Section 1.4). Table 3 identifies the subsections in Sections 3 and 4 where potential environmental issues are discussed and notes those issues that are not affected by the Proposed Action.

Table 3. Potential Environmental Issues

Environmental Category	Applicability	Sub-sections
Transportation, Traffic, and Infrastructure	Yes	3.1.1, 4.1.1
Ecological Resources (biological resources, wetlands, and floodplains)	Yes	3.1.2, 4.1.2
Water Quality	Yes	3.1.3, 4.1.3
Environmental Restoration	Yes	3.1.4, 4.1.4
Waste Management	Yes	3.1.5, 4.1.5
Air Quality	Yes	3.1.6, 4.1.6
Geologic Setting	Yes	3.1.7, 4.1.7
Cultural Resources	Yes	3.1.8, 4.1.8
Noise	Yes	3.1.9, 4.1.9
Human Health	Yes	3.1.10, 4.1.10
Socioeconomics	The Proposed Action would not have long-term effects on social or economic resources and issues in Los Alamos or the region. It is unlikely that access controls along Pajarito Road would measurably affect the economic outlook of businesses or accessibility to residences in White Rock. In 2000, DOE renegotiated a 30-year easement along SR 4 from Rover Drive to East Jemez Road to assure continued access to White Rock.	
Land Use	The Proposed Action would not alter current land use designations at LANL. Limiting access would assure land uses remain consistent with the SWEIS and the LANL Comprehensive Site Plan 2000.	N/A
Visual Resources	The Proposed Action would not create new vistas or otherwise alter the visual resources of the project area.	N/A
Environmental Justice	Populations that are subject to Environmental Justice considerations are present within 50 mile (mi) (80 kilometers [km]) of Los Alamos County; potential effects of this project would be localized within a 10-mi (16-km) radius. Populations nearest to the construction site and within this radius are not predominantly minority and low-income populations.	N/A

The Proposed Action would be implemented within the area of Los Alamos County that includes LANL. LANL comprises a large portion of Los Alamos County and extends into Santa Fe County. LANL is situated on the Pajarito Plateau along the eastern flank of the Jemez Mountains and consists of 49 technical areas spread out over 43 mi^2. The Pajarito Plateau slopes downward towards the Rio Grande along the eastern edge of LANL and contains several fingerlike mesa tops separated by relatively narrow and deep canyons.

Commercial and residential development in Los Alamos County is confined primarily to several mesa tops lying north of the core LANL development, in the case of the Los Alamos town site, or southeast, in the case of the communities of White Rock and Pajarito Acres. Approximately 12 percent of the land in Los Alamos County is privately held. The lands surrounding Los Alamos County are largely undeveloped wooded areas with large tracts located to the north, west, and south of LANL that are administered by the Department of Agriculture, Santa Fe National Forest, and the Department of the Interior (DOI), National Park Service, Bandelier National Monument. Lands to the east of LANL are administered by the DOI, Bureau of Land Management or are the property of San Ildefonso Pueblo.

Detailed descriptions of LANL's natural resources environment, cultural resources, socioeconomics, waste management, regulatory compliance record, and general operations are described in detail in the SWEIS (DOE 1999a). Additional information is available in the most recent annual Environmental Surveillance Report (LANL 2001a) and the *Special Environmental Analysis for the Department of Energy, National Nuclear Security Administration, Actions taken in Response to the Cerro Grande Fire at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 2000). These documents are available at the Public Reading Room at 1619 Central Avenue, Los Alamos, New Mexico.

3.1 Affected Resources Issues

This section describes those affected resources and issues listed in Table 3. Section 4 analyzes the anticipated effects of implementing the Proposed Action and the No Action Alternative on the resources.

3.1.1 Transportation, Traffic, and Infrastructure

Motor vehicles are the primary method of transportation and highways are the primary access to LANL and the rest of Los Alamos County. Eighty-two percent of commuters in Los Alamos County drive alone while about 11 percent ride share. Use of mass transit has been low although a New Mexico State Highway and Transportation Department regional park and ride pilot project in 1998 was very popular, temporarily taking several hundred vehicles off the roads. LANL has a number of roads, including major thoroughfares, which can be used for unrestricted vehicular access to LANL technical areas and buildings. However, since NNSA controls the entire area within the LANL boundaries, it has the option to restrict traffic on LANL roadways (DOE 1997a) and frequently does so for operational purposes. These road closures are usually short-term events (minutes to hours in length). There are four main access points to LANL that convey about 43,000 average daily trips (ADTs). These roads and their ADTs are shown in Table 4. The LANL TA-3 area is accessed from Pajarito Road, East and West Jemez Roads, and Diamond Drive. Traffic on these roadways can be heavy, particularly during peak commuting hours. At present, the nearby Diamond Drive and Jemez Road intersection experiences

considerable congestion during peak traffic periods (DOE 1997b). Los Alamos County peak period traffic volumes and resulting congestion are greatly influenced by the over 12,000 LANL employees in the region, LANL being the main source for employment in Los Alamos County, existing roadway network constraints, and the unique topography of the Pajarito Plateau.

Table 4. LANL Main Access Points

Location	Average Daily Vehicle Trips
Diamond Drive across the Los Alamos Canyon Bridge	28,000
Pajarito Road	8,000
East Jemez Road	6,000
SR 4/West Jemez Road from the west	1,000
Total	43,000

Source: DOE 1997a

SR 501 (also known as West Jemez Road) lies within LANL boundaries and is under the administrative control of the NNSA. It provides public access between Los Alamos town site and SR 4 (which provides access to Bandelier National Monument and to the Valle Grande and points beyond). It also provides the primary access between LANL's TA-3 and TA-16 areas and to other interior technical areas. Although designated as a State Road, it is not the property of the State of New Mexico; NNSA retains administrative control of this highway. East Jemez Road (also called the Truck Route) also lies within LANL and is under NNSA control. It serves as the primary access road between LANL and White Rock and to locations beyond Los Alamos County. A truck inspection station is located on East Jemez Road just west of SR 4. The entrance to Los Alamos Neutron Science Center (TA-53) is along East Jemez Road; the Los Alamos County Landfill and Royal Crest Trailer Park are also served by East Jemez Road.

Pajarito Road is also within LANL boundaries and is administered by the NNSA. It has been open to vehicular access by the public for many years. It is used by the public for travel between White Rock and Los Alamos town site. There are many LANL facilities along or accessed from Pajarito Road, including TA-54, TA-18, TA-50, and TA-55.

There are no sidewalks or improved bicycle lanes along West Jemez, East Jemez, or Pajarito Roads. There are major utility lines at TA-3, including the areas proposed for the bypass road alignments. These include above and below ground electric power lines, natural gas pipelines, sanitary sewer pipelines, radioactive liquid waste pipelines, potable and non-potable water pipelines, electric and telecommunication duct banks, storm drains and pipelines, and steam and condensate pipelines.

3.1.2 Ecological Resources

A number of regionally protected and sensitive (rare or declining) species have been documented in the LANL region. These include three Federally listed endangered species: the whooping crane (*Grus americana*), the southwestern willow flycatcher (*Empidonax traillii extimus*), and the black-footed ferret (*Mustela nigripes*), and two Federally listed threatened species: the bald eagle (*Haliaeetus leucocephalus*) and the Mexican spotted owl (*Strix occidentalis*). Under the Endangered Species Act of 1973 (16 USC 1531) as amended, Federal government agencies are

required to consider the potential effects of all activities on Federally-listed threatened and endangered (T&E) species and their critical habitat.

The LANL Threatened and Endangered Species Habitat Management Plan (HMP) (LANL 1998a) establishes AEIs that are being managed and protected because of their significance to biological or other resources. Habitats of threatened or endangered species that occur or may occur at LANL are designated as AEIs. Activities are restricted in an AEI during breeding season until it is determined that the habitat is not occupied for that year. UC personnel perform annual surveys of the AEI early in the breeding season to determine the presence of breeding pairs. If the habitat is occupied, the AEI restrictions remain in place until the completion of the breeding season. Any activities that cannot be performed within the guidelines of the HMP require further consultation with the U.S. Fish and Wildlife Service.

Wetlands are transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands in the general LANL region provide habitat for mammals, birds, reptiles, amphibians, water-dependent mammals such as shrews, and invertebrates (such as insects). Wetlands also potentially contribute to the overall habitat requirements of the Mexican spotted owl, southwestern willow flycatcher, and spotted bat (*Euderma maculatum)*, all of which are Federal- or state-listed species, or both. Wetlands also provide habitat, food, and water for many common species such as deer, elk, small mammals, and many migratory birds and bats. The majority of the wetlands in the LANL region are associated with canyon stream channels or are present on mountains or mesas as isolated meadows containing ponds or marshes, often in association with springs or seeps. A 1996 field survey by LANL personnel identified an estimated 50 ac (20 ha) of wetlands within LANL boundaries, with more than 95 percent of these located in the Sandia, Mortandad, Pajarito, and Water Canyons watersheds. About 20 percent (16 ac [7.2 ha]) of the total wetlands at LANL were burned in the Cerro Grande Fire. Wetlands in Mortandad, Pajarito, and Water Canyons received increased amounts of ash and hydromulch runoff as a result of the fire (LANL 2001b).

DOE regulations (10 CFR 1022) define a flood or flooding as " . . . a temporary condition of partial or complete inundation of normally dry land areas from . . . the unusual and rapid accumulation of runoff of surface waters. . . ." The base floodplain is the area inundated by a flood having a 1.0 percent chance of occurrence in any given year (referred to as the 100-year floodplain). The critical-action floodplain is the area inundated by a flood having a 0.2 percent chance of occurrence in any given year (referred to as the 500-year floodplain).

Pursuant to Executive Order 11988 (EO 11988), Floodplain Management, each Federal agency is required, when conducting activities in a floodplain to take actions to reduce the risk of flood damage; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. The Special Environmental Analysis (DOE 2000) describes the actions taken in response to the fire, particularly for floodwater control. As a result of the fire, soil erosion, debris, water, ash, and silt have increased exponentially compared to pre-fire ratios. Mitigation for these problems include revegetation, channel work, and debris cleanup in floodplains.

The proposed Western Bypass Road would transect an undisturbed area, which is comprised of mainly ponderosa pine (*Pinus ponderosa* P. & C. Lawson) with native grasses and understory

brush (USDA 2001). Understory brush along the proposed corridor of the Western Bypass Road consists of Gamble's oak (*Quercus gambelii* Nutt), skunk bush sumac (*Rhus trilobata* Nutt), mountain mahogany (*Cercocarpus montanus* Raf.), gooseberry (*Ribes inerme* Rydb.), and New Mexico locust (*Robinia neomexicana* Gray). The understory of the area surrounding the site consists of little blue stem (*Schizachyrium scoparium* [Michx.] Nash) and blue grama (*Bouteloua gracilis* [Willd. ex Hunth] Las. ex Griffiths) grasses, with hairy aster (*Heterotheca villosa* [Pursh] Shinners), broom snakeweed (*Gutierrezia sarothrae* [Pursh] Britt. and Rusby), and New Mexico lupine (*Lupinus neomexicanus* Greene).

The proposed Eastern Bypass Road corridor crosses Mortandad Canyon, Sandia Canyon, and relatively level areas between Pajarito Road and West Jemez Road. Mortandad Canyon is approximately 100 ft (30 m) deep and 150 ft (45 m) wide in this area. The proposed Eastern Bypass Road also transects undisturbed areas, which are comprised of mainly ponderosa pine with mixed conifer in the canyons, consisting of Douglas fir (*Pseudotsuga menziesii* [Mirbel] Franco) and White fir (*Abies concolor* [Gord. & Glend.] Lindl. Ex Hildebr.), with native grasses and understory brush.

The proposed Eastern Bypass Road would traverse floodplains in Sandia and Mortandad Canyons and a small wetland. The Sandia Canyon wetland area is about 8 ac (3.2 ha) in size and is located to the east side of the rubble pile of concrete and asphalt material that was used to partially fill in this part of the canyon years ago. The entire lengths of both of these canyons are considered 100-year floodplains, with the exception of the partially filled site in Sandia Canyon. There is wetland vegetation along portions of the Eastern Bypass corridor, including cottonwoods (*Populus augustifolia* [James]), coyote willows (*Salix exigua* Nutt), broad-leaf cattail (*Typha latifolia* L.), and rushes (*Juncus* sp.). No wetland or floodplains are located along or near the proposed Western Bypass corridor. Four newly staffed access-control stations would be constructed in developed areas at existing roadway intersections, along existing paved roads, corridors, or along the new bypass road corridors.

3.1.3 Water Quality

Surface water at LANL occurs primarily as short-lived or intermittent reaches of streams. Perennial springs on the flanks of the Jemez Mountains supply base flow into the upper reaches of some canyons, but the volume is insufficient to maintain surface flows across LANL. Runoff from heavy thunderstorms or heavy snowmelt can reach the Rio Grande. Effluents from sanitary sewage, industrial water treatment plants, and cooling tower blow-down enter some canyons at rates sufficient to maintain surface flows for varying distances (DOE 1999a). Surface waters at LANL are monitored by UC and the NMED to survey the environmental effects of LANL operations. Planned releases from industrial and sanitary wastewater facilities within LANL boundaries are controlled by NPDES permits.

The nature and extent of groundwater within the LANL region have not been fully characterized. Alluvial groundwater bodies have been identified primarily by drilling wells in locations where impacts from LANL operations are most likely to occur (DOE 1999a). On LANL property, continually saturated alluvial groundwater bodies occur in Mortandad, Los Alamos, Pueblo, Sandia, and Pajarito Canyons. The depth to these alluvial groundwater bodies varies from approximately 90 ft (27 m) in the middle of Pueblo Canyon to 450 ft (135 m) in lower Sandia Canyon (LANL 1993). The main aquifer is separated from the alluvial groundwater bodies by

350 to 620 ft (105 to 186 m) of unsaturated volcanic tuff and sediments (Purtymun 1995). The aquifer is relatively insulated from the alluvial groundwater bodies by these geologic formations. Recharge of the aquifer is not fully understood nor characterized and it is not strongly interconnected across its extent. Groundwater within the LANL area is monitored to provide indications of the potential for human and environmental exposure from contaminants (DOE 1999a). Groundwater protection and monitoring requirements are included in DOE Order 5400.1, General Environmental Protection Program.

Data and analysis of LANL surface and groundwater quality samples taken from test wells indicate that LANL operations and activities have affected the surface water within LANL boundaries and some of the alluvial and intermediate perched zones in the LANL region. Details on the surface and groundwater quality can be found in the annual LANL Environmental Surveillance and Compliance Report (LANL 2001a).

Radiation (gross alpha, gross beta, and gross gamma) and radionuclide levels in surface waters are generally below and close to analytical detection limits and well within drinking water and public dose standards. Metals in surface water samples are typically within applicable standards when the samples are filtered before analysis. However, metal concentrations exceeding drinking water standards are relatively widespread when samples are not filtered. Plutonium concentrations exceed regional comparison values in several sediment samples. In general, while some sediment samples exceed regional comparison value concentrations for metals, most of these metals may occur naturally in the sediments. The exception to this is selenium in sediments from upper Los Alamos Canyon, which far exceeds regional comparison concentrations (DOE 1999b).

In the regional aquifer, which serves LANL and Los Alamos County, most radiochemical measurements were below the DOE drinking water standards or the Environmental Protection Agency (EPA) or New Mexico standards applicable to a drinking water system (LANL 2001a). In addition, most of the analytical results were near or below the detection limits of the analytical methods used. The exceptions include Am-241, Pu-238, -239, -240, and other isotopes. In many cases, duplicate analyses did not support the apparent detections indicating that these apparent detections are more likely false positives (LANL 2001a). Trace amounts of tritium, plutonium, americium, and strontium have been detected, but not in the water supply wells. Organic compounds have also been detected in samples from test wells at TA-49, and nitrate has been detected down-canyon from Los Alamos County's Bayo wastewater treatment plant (WWTP), which discharges into lower Pueblo Canyon. Contaminants also have been detected in alluvial and intermediate perched groundwater (DOE 1999b).

Canyons that drain the TA-3 area include Los Alamos, Sandia, Two-mile, and Mortandad Canyons. The streams within these canyons are ephemeral with the exception of Sandia Canyon. The stream in Sandia Canyon is sustained almost entirely by effluent discharges from outfalls at TA-3 and flows year-round in the TA-3 area. Continuous flow combined with storm water runoff usually does not extend beyond the middle canyon. All but Two-mile Canyon have perched aquifers within the alluvium along the canyon floor.

The upper reaches of these canyons, again with the exception of Sandia Canyon, in the TA-3 area generally have very low levels of contamination. Low levels of organic chemicals within the canyons are commonly found to be associated with runoff from light industrial settings at the

laboratory and urban settings in the Los Alamos town site. These levels of organic contaminants may represent only small releases or dispersed sources. Radionuclide and metals concentration levels are generally close to background and usually are not more than twice the background values. Radionuclide concentrations are higher in sediments downstream of TA-2 in Los Alamos Canyon. Radionuclide contamination in the uppermost portions of Mortandad Canyon have been remediated to background levels (LANL 1997, 1998b, 1999a, 1999b). Contamination in the uppermost portions of Sandia Canyon in the TA-3 area is directly related to outfalls and potential release sites (PRSs) within TA-3.

3.1.4 Environmental Restoration

NNSA and UC at LANL are jointly responsible for implementing the DOE ER Program at LANL which is a designated Resource Conservation and Recovery Act (RCRA) facility. NNSA, through the Los Alamos Site Office (LASO), conducts site characterization and waste cleanup (corrective action) activities at PRSs at LANL. Site characterization and cleanup is needed to reduce risk to human health and the environment posed by potential releases of contaminants at ER Project sites.

PRSs include solid waste management units[3] (SWMUs) and areas of concern[4] (AOCs), collectively. PRSs at LANL include septic tanks and lines, chemical storage areas, wastewater outfalls (the area below a pipe that drains wastewater), material disposal areas (landfills), incinerators, firing ranges and their impact areas, surface spills, and electric transformers. PRSs are found on mesa tops, in material disposal areas, in canyons, and in a few areas in the Los Alamos town site.

The primary means of contaminant release from these sites are surface water runoff carrying potentially contaminated sediments and soil erosion exposing buried contaminants. The main pathways by which released contaminants can migrate are infiltration into alluvial aquifers, airborne dispersion of particulate matter, and sediment migration from surface runoff. The contaminants involved include volatile organic compounds (VOCs), semivolatile organic compounds, polychlorinated biphenyls (PCBs), asbestos, pesticides, herbicides, heavy metals, beryllium, radionuclides, petroleum products, and high explosives (HE). The 1999 LANL SWEIS (DOE 1999a) contains additional information on contaminants.

3.1.5 Waste Management

LANL generates solid waste[5] from construction, demolition, and facility operations. These wastes are managed and disposed of at appropriate solid waste facilities. Both LANL and Los

[3] A SWMU is defined in the Hazardous and Solid Waste Amendments Module VIII of LANL's Hazardous Waste Facility Permit as "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released."

[4] Sites that potentially contain hazardous substances but not hazardous wastes or hazardous constituents as defined by RCRA are called AOCs. The different geologic media of the canyons system—sediments, aquifers, and parent material—are categorized as AOCs.

[5] Solid waste, as defined in the Code of Federal Regulations (40 CFR 261.2) and in the New Mexico Administrative Code (20 NMAC 9.1), is any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities.

Alamos County use the same solid waste landfill located within LANL boundaries on DOE administered land. The Los Alamos County Landfill also accepts solid waste from other neighboring communities. The Los Alamos County Landfill receives about 52 tons per day (47 metric tons per day), with LANL contributing about 8 tons per day (7 metric tons per day), or about 15 percent of the total. When the current Los Alamos County Landfill closes it would be capped and monitored and a portion of the site could be used as a transfer station and recycling center. NNSA and UC are currently investigating future waste management options for LANL solid waste.

Building debris storage yards on Sigma Mesa (TA-60) or other approved material management areas are used at LANL to store concrete rubble, soil, and asphalt for future re-use at LANL. Low-level radioactive waste is disposed of at LANL, TA-54, Area G, or is shipped offsite to appropriate permitted facilities. Hazardous waste[6] regulated under RCRA is transported to TA-54 at LANL for proper management, which is carried out in accordance with applicable laws, regulations, and DOE Orders. Hazardous wastes and mixed wastes are both treated and disposed of offsite since LANL has no onsite disposal capability for these waste types. The offsite disposal locations are located across the U.S. and are audited for regulatory compliance before being used by UC.

3.1.6 Air Quality

Air quality is a measure of the amount and distribution of potentially harmful pollutants in ambient air[7]. Air surveillance at Los Alamos includes monitoring emissions to determine the air quality effects of LANL operations. UC staff calculates annual actual LANL emissions of regulated air pollutants and reports the results annually to the NMED. The ambient air quality in and around LANL meets all EPA and DOE standards for protecting the public and workers (LANL 2001a).

LANL is a major source of air emissions. A major source is one that has the potential to emit more than 100 tons per year of certain nonradioactive substances under the State of New Mexico Operating Permit program. Combustion units are the primary point sources of criteria pollutants (nitrogen oxides, sulfur oxides, particulate matter, carbon monoxide, and VOCs) emitted at LANL. Specifically, LANL is a major source of nitrogen oxides, emitted primarily from the TA-3 steam plant boilers although actual emissions reported to NMED in 2000 were 62 tons (LANL 2000a).

Mobile sources, such as automobiles and construction vehicles, are additional sources of air emissions; however, mobile sources are not regulated by NMED. Diesel emissions from

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[6] Hazardous waste, as defined in 40 CFR 261.3, which addresses RCRA regulations, and by reference in 20 NMAC 4.1, is waste that meets any of the following criteria: a) waste exhibits *any* of the four characteristics of a hazardous waste: ignitability, corrosivity, reactivity, or toxicity; b) waste is specifically *listed* as being hazardous in one of the four tables in Subpart D of the Code of Federal Regulations; c) waste is a mixture of a *listed* hazardous waste item and a nonhazardous waste; d) waste has been *declared* to be hazardous by the generator.

[7] Ambient air is defined in 40 CFR 50.1 as "that portion of the atmosphere external to buildings, to which the public has access." It is defined in the NMAC Title 20, chapter 2, part 72, as "the outdoor atmosphere, but does not include the area entirely within the boundaries of the industrial or manufacturing property within which the air contaminants are or may be emitted and public access is restricted within such boundaries."

conveyance vehicles are not regulated as stationary sources of emissions. Mechanical equipment including bulldozers, excavators, backhoes, side booms, tamper compactors, trenchers, and drill rigs are exempt from permitting under Title 20 of the NMAC Part 2.72, *Construction Permits.* This type of exemption does not require notification to NMED.

Both EPA and NMED regulate nonradioactive air emissions. NMED does not regulate dust from excavation or construction, but UC or their subcontractors take appropriate steps during construction activities to control fugitive dust and particulate emissions using, for example, Best Achievable Control Measures of water sprays or soil tackifiers.[8] Excavation and construction activities are not considered stationary sources of regulated air pollutants under the New Mexico air quality requirements; these activities are not subject to permitting under 20 NMAC, Parts 2.70 and 2.72. Annual dust emissions from daily windblown dust are generally higher than short-term construction-related dust emissions. LANL would ensure that the New Mexico Ambient Air Quality Standards (NMAAQS) and the National Ambient Air Quality Standards (NAAQS) for particulate emissions are met throughout any construction activities.

Provisions of 20 NMAC 2.72 require construction permits for new or modified sources of regulated air pollutants. Portable asphalt, rock crushing, or concrete plants require New Mexico Air Quality construction permits. If already permitted, a relocation notice must be filed with NMED. It may be necessary for the Proposed Action to include additional equipment, such as fuel-fired generators, in a construction permit. Permitting would take approximately six months. In addition, equipment issued a construction permit would require a change or update to the Title V Operating Permit Application. At the completion of the construction permitting process, the information required to update the Title V Operating Permit Application would be available. UC air quality staff would update the Title V Operating Permit Application.

3.1.7 Geologic Setting

The Jemez Mountains volcanic field (JMVF) is located in northern New Mexico at the intersection of the western margin of the Rio Grande Rift and the Jemez Lineament (Smith et al., 1970; Gardner et al., 1986; Heiken et al., 1996). The JMVF is the largest volcanic center along this lineament (ERP 1992). Volcanism in the JMVF spans a roughly 16-million-year period beginning with the eruptions of numerous basaltic lava flows and most recently in the eruption of the rhyolitic Bandelier Tuff at 1.79 and 1.23 million years ago (Self and Sykes 1996). All of LANL property is within the JMVF and is sited along the western edge of the Rio Grande Rift. Most of the bedrock on LANL property is composed of Bandelier Tuff.

The geologic structure of the LANL area is dominated by the north-trending Pajarito Fault Zone. The Pajarito Fault Zone consists of three major faults (Pajarito Fault, Rendija Canyon Fault, and the Guaje Mountain Fault) and numerous secondary faults with vertical displacements ranging from 80 to 400 feet. Estimates of the timing of the most recent surface rupturing paleoearthquakes along this fault range from 3000 to 24,000 years ago (Reneau and Gardner 1999, McCalpin 2000, Gardner et al., 1999, 2001).

[8] Tackifiers are chemical dust suppressants often added to water that acts to disperse the chemicals, then evaporates after application. The chemicals that are left behind bind the soil particles together into larger particles that are less easily blown in the air.

The entire TA-3 area is bounded by the Pajarito Fault on the west and the Rendija Canyon Fault on the east (Gardner et al., 1999). As such, the proposed bypass roads would be in an area of generally higher potential for seismic surface rupture relative to locations farther removed from the Pajarito Fault Zone (Gardner et al., 2001). Both the proposed Eastern and Western Bypass Roads are projected to cross secondary faults (see Figure 6). However, probabilistic analysis of 1 in 10,000 years seismic events suggests that significant seismic events are only expected to occur along, or on, the main trace of the Pajarito Fault west of SR 501 (Gardner et al., 2001).

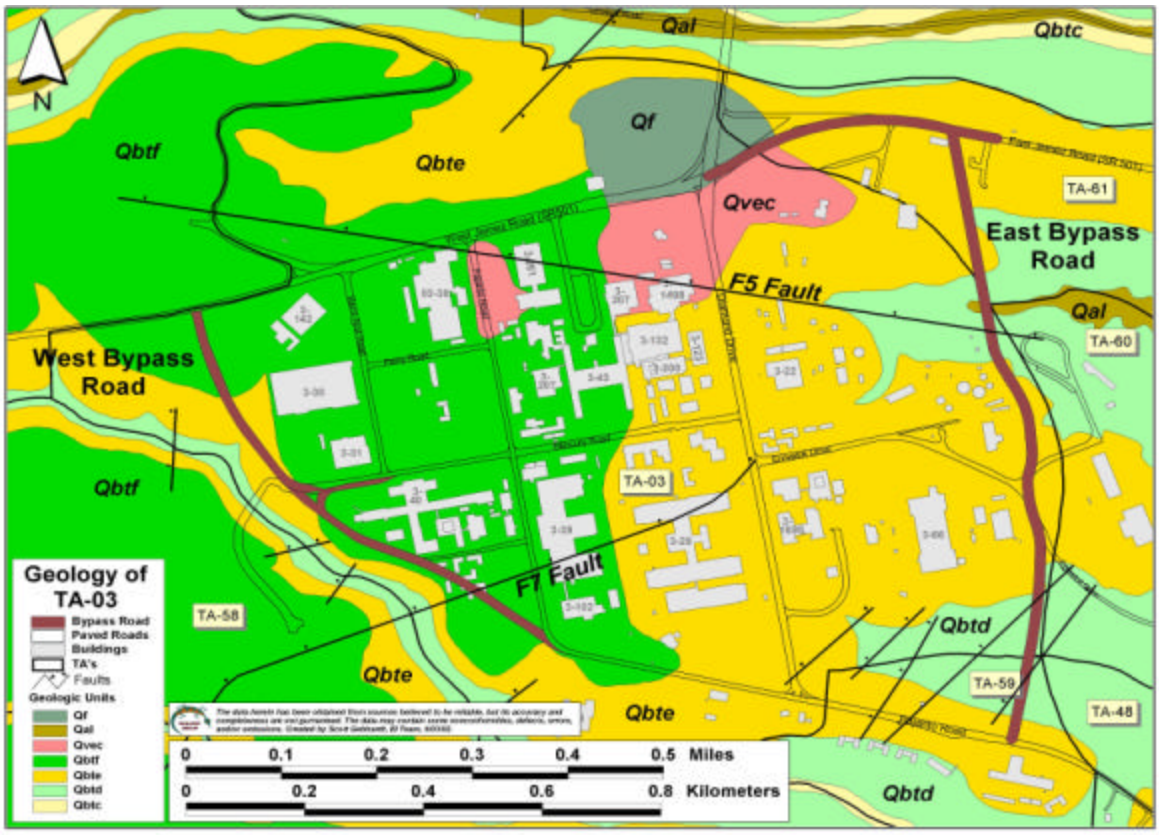

Figure 6. Locations of faults and the related geology relative to proposed bypass roads.

Parts of the TA-3 bypass roads would be constructed upon fill material and geologically deposited soil materials as opposed to bedrock. This fill was placed in Sandia Canyon over many years without structural reinforcements sufficient for the proposed bypass roads. A surface rupturing seismic event within or near the Pajarito Fault Zone could have considerable consequences for roads or bridges not constructed on bedrock. Depending upon porosity, permeability, and groundwater saturation, seismic vibrations could potentially cause soil "liquefaction"—essentially converting the soil or fill into acting like it was a fluid.

Many different types of soils have developed on the mesa tops and canyon walls and bottoms of the Pajarito Plateau. An extensive soil survey was carried out in the late 1970s for Los Alamos

County including the lands occupied by LANL. Most of the information reported here is derived from this report (Nyhan et al, 1978).

Soils information can be applied in managing land for many uses including conservation, wildlife habitat, urban planning, agricultural uses, and others. Detailed soils information can be used for site selection for buildings, roads, and other structures and for locating suitable sources of materials for road fill, sand, gravel, and topsoil. The properties of a soil, in various degrees and combinations, affect construction and maintenance of roads, building foundations, and buried utilities. The most important properties of soils for engineering projects are permeability, strength, compaction characteristics, drainage characteristics, shrink-swell potential, grain size, plasticity, reaction, depth to the water table, depth to bedrock, and slope.

Within TA-3 there are approximately nine distinct soil types (see Figure 7). However, only four of these exist in the area of the Proposed Action. These include the Carjo Series, the Tocal Series, and two rock outcrops.

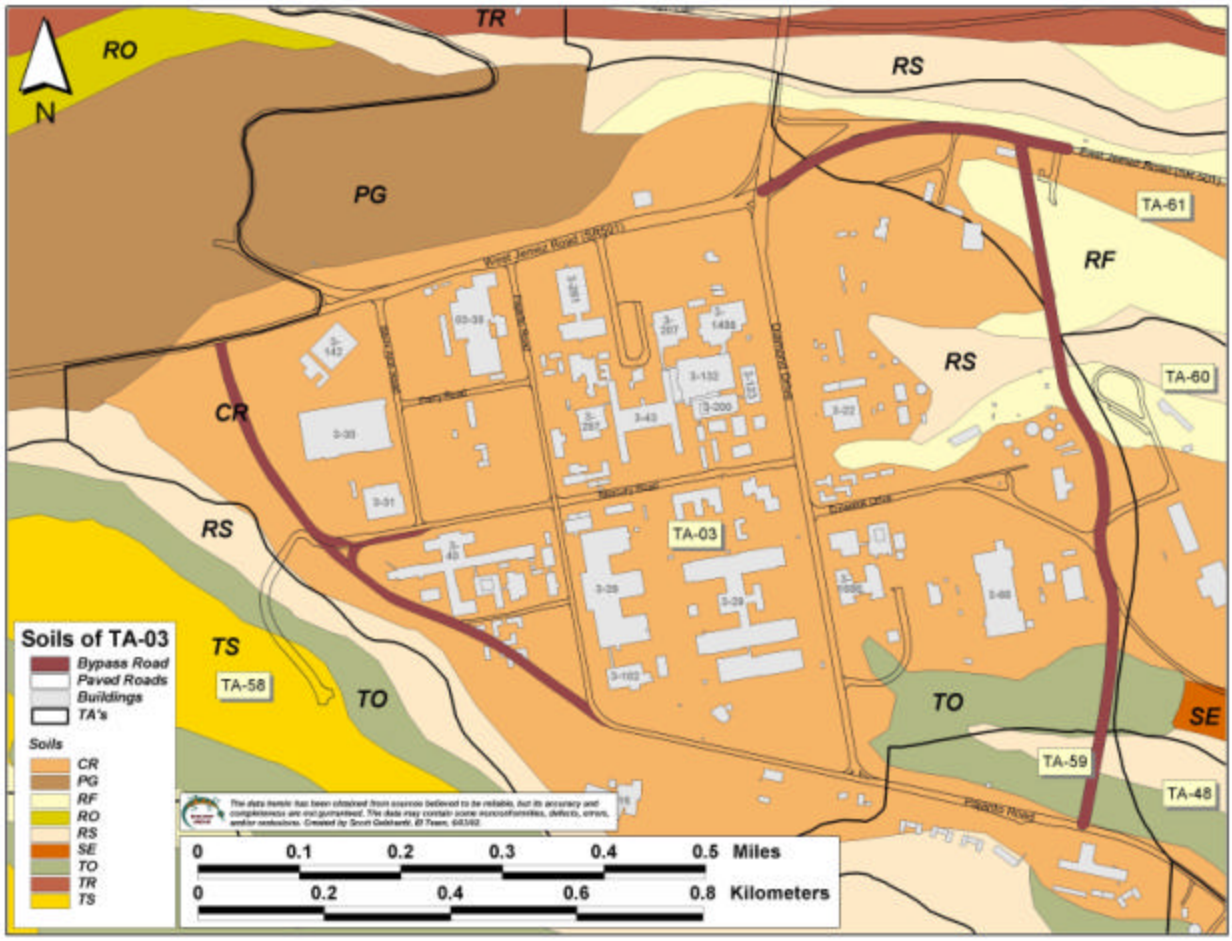

Figure 7. Distribution of various soil types in the TA-3 area.

The Carjo Series (CR) consists of moderately deep, well-drained soils that formed in material weathered from tuff. These soils are found on nearly level to moderately sloping mesa tops near the Jemez Mountains. The surface layer of the Carjo soils is a grayish brown loam, or very fine sandy loam about 10 cm thick. The subsoil is a brown and reddish brown clay loam and clay about 40 cm thick. The substratum is a light brown, very fine sandy loam about 10 cm thick. Depth to tuff and the effective rooting depth range from 51 to 102 cm and the available water holding capacity is medium. Runoff in this slowly permeable soil is medium, and the water erosion hazard is moderate (Nyhan et al., 1978).

The Tocal Series (TO) consists of very shallow to shallow, well-drained soils that formed in material weathered from tuff on gently to moderately sloping mesa tops. The surface layer of Tocal soils is a grayish brown very fine sandy loam about 10 cm thick. The subsoil is a reddish brown clay loam, or clay, about 15 cm thick. The substratum is a light brown silt loam about 5 cm thick. Depth to tuff and the effective rooting depth range from 20 to 50 cm. The permeability is moderately slow and the available water capacity is low. Runoff is medium and the water erosion hazard is moderate (Nyhan et al., 1978).

The rock outcrop (RF and RS) land types are based (partly) on slope. The RF land type is found on gently sloping to steep mesa tops and edges and consists of about 65 percent rock outcrop (Bandelier Tuff), 5 percent very shallow undeveloped soils, 5 percent Tocal soils, and 25 percent narrow escarpments. The RS land type has slopes greater than 30 percent on steep to very steep mesa breaks and canyon walls. It consists of about 90 percent rock outcrop (Bandelier Tuff) and 10 percent very shallow undeveloped soils (Nyhan et al., 1978).

Based on engineering properties discussed in Nyhan et al (1978), the two rock outcrop land types (RF and RS) are well suited for road construction as they consist predominantly of local bedrock. However, both the Carjo (CR) and Tocal (TO) Series soils are rated 'moderate' for road construction. These soil types both expand when wet and contract when dry, have low strength to support roads, and are characterized as having bedrock too near the surface. A rating of 'moderate' indicates that some soil properties are unfavorable but can be overcome or modified by special planning and design. The soils may need to be stabilized or replaced with material suitable for supporting roads with heavy traffic use.

3.1.8 Cultural Resources

Cultural resources include any prehistoric sites, buildings, structures, districts, or other places or objects considered to be important to a culture or community for scientific, traditional, religious, or any other reason. They combine to form the human legacy for a particular place (DOE 1999a). To date, over 1,950 archaeological sites and historic properties have been recorded at LANL. There is one recorded Traditional Cultural Property (TCP) within the project area near Jemez and Diamond intersection. There is also an Archaic Period lithic scatter and a portion of an historic wagon trail. In addition, a portion of Building 3-40 (an historic building) may require removal in consultation with the State Historic Preservation Office (SHPO).

The criteria used for evaluating cultural resources depends upon their significance as sites eligible for listing to the National Register of Historic Places (NRHP) as described in the National Historic Preservation Act (16 USC 470). These determinations of significance are met

by evaluating each cultural resource based on it meeting any one or more of the following four characteristics:

- Association with events that have made a significant contribution to the broad pattern of our history.
- Association with the lives of persons significant in our past.
- Illustration of a type, period, or method of construction; for its aesthetic values or for its representation of the work of a master; or if it represents a significant and distinguished entity whose components may lack individual distinction.
- It has yielded, or may be likely to yield, information important in prehistory or history.

The cultural resources at or near the proposed Bypass Road corridors and Proposed Action locations are not eligible for listing to the NRHP with the exception of the Physics Building. This building was constructed in the 1950s and is an important building in LANL history and is considered eligible for the NRHP.

3.1.9 Noise

Noise is defined as unwanted sound. Noise is categorized into two types: *continuous noise*, which is characterized as longer duration and lower intensity, such as a running motor, and *impulsive or impact noise*, which is characterized by short duration and high intensity, such as the detonation of HE. The intensity of sound is measured in decibel units and has been modified into an A-weighted frequency scale (dBA) for setting human auditory limits.

Noise measured at LANL is primarily from occupational exposures that generally take place inside buildings. Occupational exposures are compared against an established Threshold Limit Value (TLV). The TLV is administratively defined as the sound level to which a worker may be exposed for a specific work period without probable adverse effects on hearing acuity. The TLV for continuous noise is 85 dBA for an eight-hour work day. The TLV for impulsive noise during an eight-hour work day is not fixed because the number of impulses allowed per day varies depending on the dBA of each impulse, however, no individual impulse should exceed 140 dBA. An action level (level of exposure to workplace noise that is below the TLV but the use of PPE is recommended) has been established for noise in the workplace at LANL. The action level for both continuous and impulsive noise is 82 dBA for an eight-hour work day.

Environmental noise levels at LANL are measured outside of buildings and away from routine operations. These sound levels are highly variable and are dependent on the generator. The following are typical examples of sound levels (dBA) generated by barking dogs (58), sport events (74), nearby vehicle traffic (63), aircraft overhead (66), children playing (65), and birds chirping (54). Sources of environmental noise at LANL consist of background sound, vehicular traffic, routine operations, and periodic HE testing. Measurements of environmental noise in and around LANL facilities and operations average below 80 dBA.

The averages of measured values from limited ambient environmental sampling in Los Alamos County were found to be consistent with expected sound levels (55 dBA) for outdoors in residential areas. Background sound levels at the White Rock community ranged from 38 to 51 dBA (Burns 1995) and from 31 to 35 dBA at the entrance of Bandelier National Monument

(Vigil 1995). The minimum and maximum values for LANL and the County ranged between 38 dBA and 96 dBA, respectively.

3.1.10 Human Health

This section considers the health of LANL and non-LANL road construction and maintenance workers. These two categories are considered in this EA because each category of worker would either be involved in the construction or the maintenance of the new bypass roads, access-control stations, and supporting infrastructure work at LANL under the Proposed Action. LANL workers would be the primary users of the proposed new roads. Members of the general public unaffiliated with LANL are not considered because they would not be allowed routine access to the proposed road.

The health of LANL workers is routinely monitored depending upon the type of work they perform. Health monitoring programs for LANL workers consider a wide range of potential concerns including exposures to radioactive materials, hazardous chemicals, physical or environmental hazards, and routine workplace hazards. In addition, LANL workers involved in hazardous operations are protected by various engineering or process controls and required to wear appropriate PPE. Training is also required to identify and avoid or correct potential hazards typically found in the work environment and to respond to emergency situations. Because of the various health monitoring programs, and the requirements for PPE, and routine health and safety training, LANL workers are generally considered to be a healthy workforce with a below average incidence of work-related injuries and illnesses.

LANL staff monitors environmental media for contaminants that could affect non-LANL workers or members of the public. This information is reported to regulatory agencies, such as the NMED and to the public through various permits and reporting mechanisms and it is used to assess the effects of routine operations at LANL on the general public. For detailed information about environmental media monitoring and doses to the public, see LANL's Environmental Surveillance Report for 2000 (LANL 2001a). For those persons that work within the boundaries of LANL as subcontractors or demolition workers and could be exposed to radioactive or other hazardous materials, their exposures are monitored in the same manner as UC workers. In addition, site-specific training and PPE requirements also apply to these workers.